

**TRIGONOMETRY (Q 4 & 5, PAPER 2)**

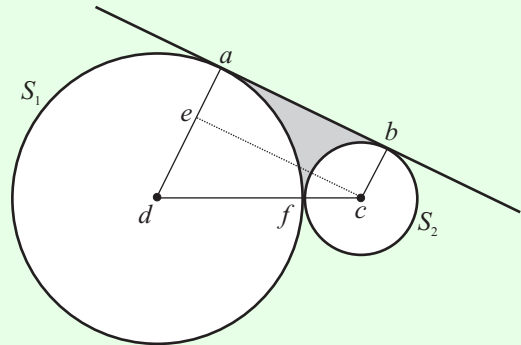
**2005**

4 (a) Evaluate  $\lim_{\theta \rightarrow 0} \frac{\sin 4\theta}{3\theta}$ .

4 (b) (i) Using  $\cos 2A = \cos^2 A - \sin^2 A$ , or otherwise, prove  $\cos^2 A = \frac{1}{2}(1 + \cos 2A)$ .

(ii) Hence, or otherwise, solve the equation  $1 + \cos 2x = \cos x$ , where  $0^\circ \leq x \leq 360^\circ$ .

4 (c)  $S_1$  is a circle of radius 9 cm and  $S_2$  is a circle of radius 3 cm.  $S_1$  and  $S_2$  touch externally at  $f$ . A common tangent touches  $S_1$  at point  $a$  and  $S_2$  at  $b$ .

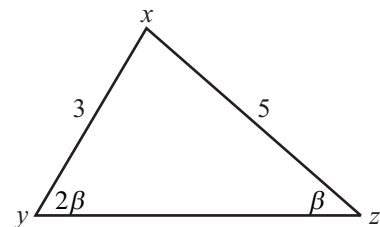


(i) Find the area of the quadrilateral  $abcd$ . Give your answer in surd form.

(ii) Find the area of the shaded region, which is bounded by  $[ab]$  and the minor arcs  $af$  and  $bf$ .

5 (a) The area of an equilateral triangle is  $4\sqrt{3}$  cm<sup>2</sup>. Find the length of a side of the triangle.

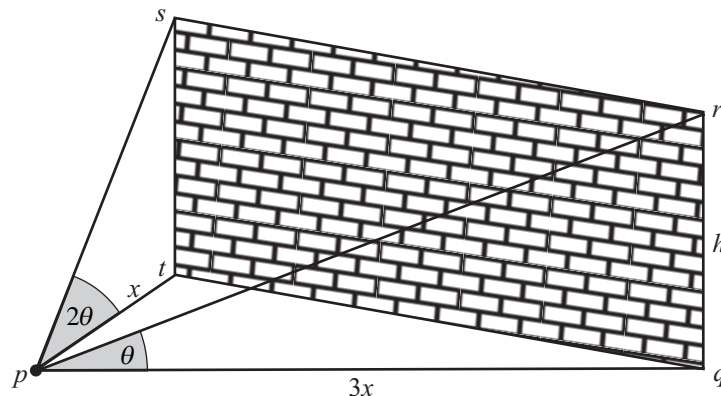
5 (b) In the triangle  $xyz$ ,  $|\angle xyz| = 2\beta$  and  $|\angle xzy| = \beta$ .  $|xy| = 3$  and  $|xz| = 5$ .



(i) Use this information to express  $\sin 2\beta$  in the form  $\frac{a}{b} \sin \beta$ , where  $a, b \in \mathbf{N}$ .

(ii) Hence express  $\tan \beta$  in the form  $\frac{\sqrt{c}}{d}$ , where  $c, d \in \mathbf{N}$ .

5 (c)  $qrst$  is a vertical rectangular wall of height  $h$  on level ground.  $p$  is a point on the ground in front of the wall. The angle of elevation of  $r$  from  $p$  is  $\theta$  and the angle of elevation of  $s$  from  $p$  is  $2\theta$ .  $|pq| = 3|pt|$ . Find  $\theta$ .



**ANSWERS**

4 (a)  $\frac{4}{3}$

4 (b) (ii)  $60^\circ, 90^\circ, 270^\circ, 300^\circ$

4 (c) (i)  $36\sqrt{3}$     (ii)  $36\sqrt{3} - \frac{33\pi}{2}$

5 (a) 4 cm

5 (b) (i)  $\frac{5}{3} \sin \beta$     (ii)  $\frac{\sqrt{11}}{5}$

5 (c)  $\frac{\pi}{6}$